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**Imaging materials - Processed colour photographs - Methods
for measuring thermal stability**
(English Translation)

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents"
Drafting:

This document is equivalent to ISO 18936:2020 "Method for measurement of thermal stability of processed color photographs of imaging materials":

Introduction

This document covers methods and procedures for measuring the long-term dark storage stability (thermal stability) of color photographs:

Currently, most photographs are made using color dyes and pigments: The preservation

time of these photographs can range from a few days to hundreds of years:

The importance of image stabilization varies: Often people do not know at first what the ultimate purpose of a particular photo will be: Understanding Color Photos the service life of the archive is important to many users, especially since the photo stability requirements often vary depending on the application:

For those who work with photographic color materials and archives, understanding the stability of these materials under various storage and display conditions is essential for their long-term preservation:

It is crucial to keep your photos in good condition:

Any change in density, contrast or colour, whether due to fading of the colourant, change in the form of the colourant or change in the residual material color, will change the appearance of the photo:

The most disruptive changes are often distortions in contrast balance caused by different fades of the three colorants: These appear as Changes in color balance in shadows are particularly noticeable in neutral tones, for example, when a photo shifts from magenta to the fading of green or yellow couplers causes the photo to shift from yellow to blue, or the fading of cyan couplers causes the photo to shift from cyan to red:

The second most important change is caused by the increase in density of the unexposed areas, which may result in the Dmin area (unexposed or unprinted) Printing) discoloration or change in Dmin color balance:

Cyan, magenta, yellow, and sometimes black, red, green, and blue color formers are dispersed in a transparent binder or adsorbed onto a coating:

Most modern color photographic images are formed on a special receiving layer on a transparent or white opaque support:

The color of the image will fade during storage and display because the image couplers rarely fade at the same rate and their color balance will usually change:

Areas of low density may turn yellow (or occasionally other colors), and physical degradation such as embrittlement and cracking of the support and image layers may occur:

The rate of fading and yellowing depends primarily on the inherent stability of the color photographic material and the conditions under which the photographs are stored and displayed:

The quality of processing is another important factor: Post-production processing of digital photos, such as lamination, packaging and color retouching, may also affect Stability of coloring materials:

The three main factors that affect storage behavior or dark stability are the temperature and relative humidity of the air contacting the photograph and atmospheric contaminants:

On the one hand, high temperatures, especially in combination with high relative humidity, can accelerate chemical reactions that may lead to degradation of one or more color formers; on the other hand, on the other hand, low temperature and low humidity storage can greatly extend the life of photographic color images: Microorganisms and insects are also potential factors for image destruction:

Most modern photographs decay so slowly under normal room conditions that their stability to dark storage cannot be assessed within a reasonable time:

However, it is possible to evaluate the possible changes of some photos under low and medium storage conditions by means of high temperature accelerated testing, because although the speed the effect of relative humidity on thermal decay can also be seen in the image:

It can be assessed by the Arrhenius test performed at two or more humidity levels:

Image density, color balance, and other properties can only be reasonably estimated if a good correlation is established between accelerated testing and actual usage conditions:

and long-term changes in the color change of the minimum density area:

Density changes caused by the test conditions and measured during and after the test Specific products latent in the base material and auxiliary layers However, for most photos, the major changes occur in the image-bearing layer: An exception is found in some inkjet papers, where the oil the ink is thermally stable and is responsible for the yellowing of the substrate:

The test used to predict the stability of color photographic images in dark storage is based on an adaptation of the Arrhenius method described by Bard et al: (see References [2] and [3]), and earlier references by Arrhenius, Steiger, and others (see references [4], [5], and [6]):

Although this approach is derived from known and validated chemical theory, its effectiveness in predicting changes in photographic images relies on empirical evidence:

Although many color-forming color products produce image fading and staining data similar to Arrhenius the relationship is consistent, but some other types of products do not: For example, integral instant color printing materials often show SARS at high temperatures:

Treatment of some chromogenic materials at temperatures and humidity above 80°C and 60% RH may result in the incorporation of high-boiling point solvents:

The dye formed by the silver dye drift will decompose under the combination of extremely high temperature and high relative humidity, resulting in color Abnormal changes in equilibrium and saturation (see reference [7]): Usually, gelatin and other adhesive materials

will undergo physical changes under high temperature and humidity:

Photographic materials tend to change significantly when relative humidity is above 60% (especially at the high temperatures used in accelerated tests):

Some humidity-sensitive inkjet materials may require lower relative humidity due to phase changes such as melting point or glass transition temperature:

test:

Image material: processed color photo Thermal stability measurement method

1 Scope

This document describes a test method for determining the long-term dark storage stability of color photographs:

This document applies to color photographs produced using conventional photographic materials: These images are obtained by developing, silver dye bleaching, dye transfer, dye expansion the test methods specified in this document also cover the use of dry and liquid toner electrophotographic Dark stability of digital color images produced by 3D printing, thermal dye transfer (sometimes called "dye sublimation"), and inkjet printing systems:

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document:

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document:

gy-Densitymeasurements-Part 3:Spectralconditions) Note: GB/T 11501-2008 Photographic density measurement Part 3: Spectral conditions (ISO 5-3:1995, IDT) Note: GB/T 12823.4-2008 Photographic density measurement Part 4: Geometric conditions for reflection density (ISO 5-4:1995, IDT) ISO 13655 Graphic technology - Spectral measurement and colorimetric calculation of graphic art images Note: GB/T 19437-2004 Printing technology Spectral measurement and colorimetric calculation of printed images (ISO 13655:1996, IDT) ISO 18913 Imaging materials-Permanence-Vocabulary ISO 18920 Imaging materials - Reflection prints - Storage practices ISO 18924 Imaging materials - Test method for Arrhenius-type predictions ISO 18941 Imaging materials - Colour photographs - Test method for ozone fading stability